

C.U.SHAH UNIVERSITY

Winter Examination-2018

Subject Name: Power Electronics II

Subject Code: 4TE07PEL1

Branch: B.Tech (Electrical)

Semester: 7

Date: 27/11/2018

Time: 10:30 To 01:30

Marks: 70

Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
 - (2) Instructions written on main answer book are strictly to be obeyed.
 - (3) Draw neat diagrams and figures (if necessary) at right places.
 - (4) Assume suitable data if needed.
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Q-1 Attempt the following questions: (14)

- 1) The range of duty cycle for a BOOST operation in a BUCK-BOOST converter is _____
A) $0 < D < 1$ B) $0 < D < 0.5$ C) $0.5 < D < 1$ D) None of the
- 2) The magnitude of output voltage at duty cycle $D=1$ for a practical BOOST converter is infinite.
A) True B) False
- 3) For a BOOST converter, input voltage = 25 V, duty cycle $D=0.5$, then output voltage is _____
A) 50 V B) 12.5 V C) 25 V D) 75 V
- 4) A forward converter is also known by an isolated _____ converter.
A) Boost B) Buck C) Buck-Boost D) None of the above
- 5) The output voltage equation for a flyback converter is $V_o =$ _____
A) $\frac{N_2}{N_1} D V_{in}$ B) $\frac{N_2}{N_1} \frac{1}{1-D} V_{in}$ C) $\frac{N_2}{N_1} \frac{1}{D} V_{in}$ D) $\frac{N_2}{N_1} \frac{D}{1-D} V_{in}$
- 6) The number of DC sources required for a Five level cascaded H Bridge inverter is _____
A) One B) Five C) Two D) Three



- 7) The number of clamping diodes required in a three level diode clamped inverter with one leg is _____
 A) Three B) Five C) Four D) Two
- 8) Which one of the below given harmonic order gets eliminated in a six pulse diode rectifier?
 A) Third B) Fifth C) Seventh D) Eleventh
- 9) In a Delta/Z-1(Zigzag) transformer the secondary line voltage lags the primary line voltage.
 A) True B) False
- 10) Give any two advantages of Zero Voltage Switching (ZVS) operation in a converter circuit.
- 11) Give any two advantages of multilevel inverter over two level inverter.
- 12) Give any two advantages of online UPS over offline UPS.
- 13) List any four drawbacks of linear regulated power supply over switch mode power supply.
- 14) Give any two advantages for increasing the number of pulses in rectifier operation.

Attempt any four questions from Q-2 to Q-8

Q-2 Attempt all questions (14)

- (a) Draw the circuit diagram of BUCK converter and explain its operation. Draw the waveforms of gate pulse applied to the switch, inductor voltage, inductor current, capacitor current, output voltage. **07**
- (b) In a BUCK converter $L = 25\mu H$. It is operating in DC steady state under following conditions. **07**

Input voltage $V_{in} = 42V$, Output power $P_o = 24W$, Duty cycle $D = 0.3$

Switching frequency $f_s = 400kHz$

Assume ideal components. Calculate i) Ripple in inductor current

ii) Average input current.

Q-3 Attempt all questions (14)

- (a) Draw the circuit diagram of FLYBACK converter and explain its operation. Draw the waveforms of gate pulse, flux, input primary current and output secondary current.



- (b) Draw the block diagram of ON LINE UPS and explain the function of each block. **07**
- Q-4 Attempt all questions (14)**
- (a) Draw the circuit diagram of three level diode clamped (neutral clamped) inverter with one leg and explain its operation. Draw the output voltage waveform of three level inverter. **07**
- (b) Draw the circuit diagram of single phase five level cascaded H Bridge inverter and explain its operation. Draw the output voltage waveforms. **07**
- Q-5 Attempt all questions (14)**
- (a) Draw the circuit diagram of five level flying capacitor inverter with one leg and explain its operation. Draw the output voltage waveform of five level inverter **07**
- (b) Draw the circuit diagram of five level diode clamped (neutral clamped) inverter with one leg and explain its operation. Draw the output voltage waveform of five level inverter. **07**
- Q-6 Attempt all questions (14)**
- (a) Draw the connections and vector diagram of Y/Z-1 (Star-Zigzag) transformer. **07**
Show that line voltage of the secondary winding leads the primary line voltage in the range of $0^\circ < \delta < 30^\circ$. Where δ is the phase difference between primary and secondary line voltage.
- (b) Draw the circuit diagram of six pulse diode rectifier (three phase full wave bridge rectifier) and waveforms of three phase input voltage, output voltage, output current, input current waveform of any one phase and explain its operation with resistive load. **07**
- Q-7 Attempt all questions (14)**
- (a) Draw the circuit diagram 12-pulse series type diode rectifier. With the help of Fourier series equation and harmonic spectrum explain which individual harmonics gets eliminated in this rectifier. **07**
- (b) Draw and explain the structure of Switched Reluctance Motor (SRM). **07**



- Q-8** **Attempt all questions** **(14)**
- (a) Draw the circuit diagram and waveforms of three phase half wave Brushless DC motor drive and explain its operation. **07**
- (b) Draw the circuit diagram and waveforms of CLASS E resonant inverter and explain its operation. **07**

